

Optoelectronic Infrastructure for RF/Optical Phased Arrays, Phase I

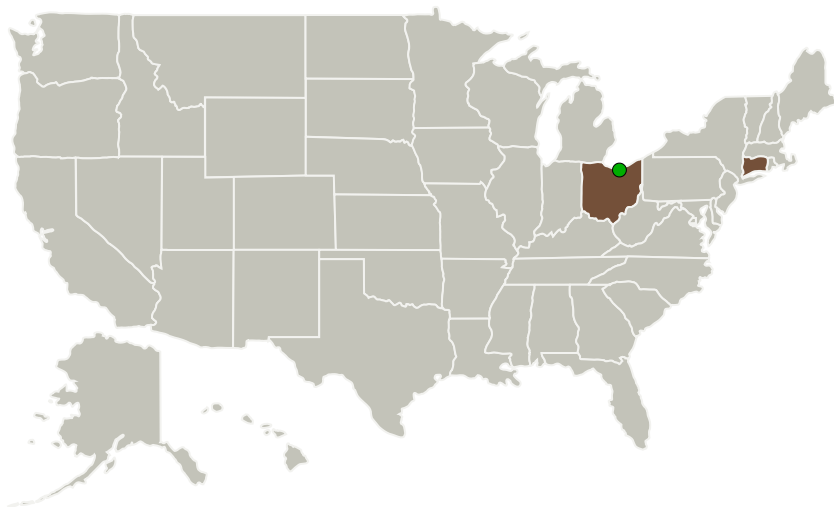
Completed Technology Project (2011 - 2011)



Project Introduction

Optoelectronic integrated holds the key to higher performance, reduced mass and radiation-hard space systems. A special need is increased flexibility of phased arrays for communication and detection. Currently RF arrays use ferrite waveguide elements for phase shifting which are both bulky and lossy with a phase shift limit of 360° . Light Detection and Ranging (LIDAR) arrays currently use a single optical source with mechanical steering. An identified goal would be an RF array with true time delay for beam steering and combined in the same physical location with an optical array steered via optical phase shift. ODIS approaches this problem with an optoelectronic circuit that integrates the RF and optical elements within a single chip. The RF at Ka band is generated by an optoelectronic oscillator and converted to RF power in a photodiode at the antenna element. The antenna element is a printed dipole on chip with dimensions of $\lambda/2$ ($\approx 4.3\text{mm}$). The optical source is an array of vertical cavity lasers spaced sufficiently closely to achieve a coherent beam. Optical beam steering is achieved by optical phase shifting of the coherent beam. In this SBIR, ODIS will demonstrate the key components integration to achieve a common RF/optical aperture.

Primary U.S. Work Locations and Key Partners



Optoelectronic Infrastructure for
RF/Optical Phased Arrays, Phase
I

Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Project Transitions	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Technology Areas	3
Target Destinations	3

Optoelectronic Infrastructure for RF/Optical Phased Arrays, Phase I



Completed Technology Project (2011 - 2011)

Organizations Performing Work	Role	Type	Location
ODIS, Inc.	Lead Organization	Industry	Mansfield, Connecticut
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Connecticut	Ohio

Project Transitions

▶ **February 2011:** Project Start

✓ **September 2011:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/140181>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

ODIS, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

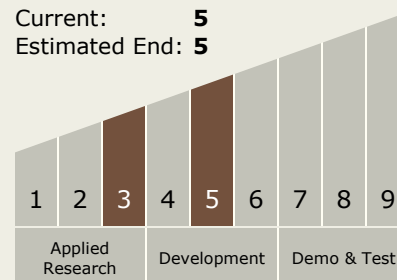
Carlos Torrez

Principal Investigator:

Jianhong Cai

Technology Maturity (TRL)

Start: 3
Current: 5
Estimated End: 5



Optoelectronic Infrastructure for RF/Optical Phased Arrays, Phase I

Completed Technology Project (2011 - 2011)



Technology Areas

Primary:

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
 - └ TX05.1 Optical Communications
 - └ TX05.1.6 Optimetrics

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System